

Interactive comment on “NALPS: a precisely dated European climate record 120–60 ka” by R. Boch et al.

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Review by Anders Svensson of the manuscript entitled 'NALPS: a precisely dated European climate record 120–60 ka' submitted to Climate of the Past by the authors R. Boch, H. Cheng, C. Spötl, R. L. Edwards, X. Wang, and Ph. Häuselmann. Clim. Past Discuss., 7, 1049–1072, 2011.

This is a paper we have been waiting for: a long, early glacial, European stalagmite record at a resolution and dating accuracy comparable to that of Greenland ice core records. For the first time, it is possible to compare Greenland and Continental European climates during the first half of the last glacial to the detail that allows discussion of chronological issues as well as possible differences in climate between the two regions. Whereas stalagmite records covering the same time interval are available from

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other parts of the world, the Central European location of the presented records allows for a very robust comparison to Greenland that has implications for many other European records as well. In a broader perspective, the NALPS record will also have important implications for understanding of Northern Hemispheric climate of the early last glacial, as it provides a missing link between on one side the North Atlantic records and on the other side the Asian records.

The resolution and the dating accuracy of the dataset presented in the MS is impressive and good replication of records is demonstrated. The MS is relevant to a broad paleoclimatic community, it is well written, and it has clear figures, so I certainly recommend publication.

I only want to elaborate on one topic that the authors may consider discussing in more detail:

Same climate history in Greenland and Europe?

In the abstract the authors state that the northern rim of the Alps 'favours comparison with the climate in Greenland'. Whereas I can only agree about this, there is an ongoing discussion in the paleo-community about the degree of similarity and synchronization of climate and climate change between Greenland and Europe during the last glacial. Some European - mainly C-14 dated terrestrial - records show evidence of a past European climate rather different from what is seen in the Greenland isotope records. See discussion and references in Blaauw et al., 2010. The observed differences may of course be due to chronological issues or interpretation of proxies, but potentially there is also the possibility that the climate evolution in Europe and in Greenland were significantly different during the last glacial.

In the present manuscript, it seems to be an assumption that climate change in the early glacial period, e.g. onset and decay of interstadial periods, appears synchronous in Greenland and in the Alps, so that one can directly compare ages of onsets and durations of events between the two regions. This may very well be the case, but it may

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be appropriate to give some argumentation for why that is a reasonable assumption. I personally find it very difficult to explain how the same sequence of abrupt climate shifts could appear both in Greenland and in Europe without being almost synchronous, but I know that many colleagues may not agree about this viewpoint. In fact, I think the work presented in the present MS probably presents one of the strongest (if not THE strongest) case(s) in favor of a very close synchronization of abrupt climate change between the two regions. The proximity in location together with the striking similarity in the patterns of the Greenland and the NALPS isotope records simply is a very strong argument that climate change during the early last glacial must have happened almost simultaneously within the two regions. How could one possibly explain a systematic offset of say just a few hundreds of years in the climate evolution between Greenland and the Alps over a period of 60 ka? I think the present dataset makes a very strong case and it may be worth elaborating a bit more on the issue before entering the discussion of chronological implications. If, namely, the climate of the two regions has been asynchronous, what you have to discuss in the MS is the issue of leads and lags in the climate system rather than chronological issues.

One important implication of an almost synchronous climate between Greenland and Europe during the last glacial would be that the quite important differences sometimes observed in the onset and duration of DO-events in Greenland and DO-like events in other European records must be caused by factors other than climate.

MINOR COMMENTS:

Please note that there is a Greenland ice core chronology available called GICC05modelext that is a composite of the layer counted GICC05 (0-60 ka) and the modeled ss09sea (>60 ka) (Wolff et al., 2010; <http://www.iceandclimate.nbi.ku.dk/data/>). In the 60-120 ka interval GICC05modelext is identical to the ss09sea time scale except that all ages are shifted towards younger ages by 705 years in order to merge the time scales at 60 ka. Whereas this is a rather cruel way of constructing a time scale, the shifting of the older section will probably

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result in a much improved correspondence between the Greenland and NALPS records. The authors are actually already mentioning that the somewhat younger GICC05 ages at 60 ka (as compared to ss09sea) are likely to have this effect, so I don't think it is necessary to change the figures to the GICC05modelext chronology.

The data table in the supplementary material really has tiny font, maybe provide as spread sheet as well?

REFERENCES:

Blaauw et al.: Were last glacial climate events simultaneous between Greenland and France? A quantitative comparison using non-tuned chronologies, *J. Quat. Sci.*, 25, 387-394, 2010.

Wolff et al.: Millennial-scale variability during the last glacial: The ice core record, *QSR*, 29, no. 21-22, Sp. Iss. Sl., pp. 2828-2838, 2010.

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